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PECCARIES (MAMMALIA, ARTIODACTYLA, TAYASSUIDAE) FROM THE MIOCENE-PLIOCENE PIPE CREEK SINKHOLE LOCAL FAUNA, INDIANA

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ABSTRACT

The Pipe Creek Sinkhole local fauna from near Swayzee, Grant County, Indiana, yields an interesting mixture of both plant and animal fossils, including previously unidentified peccaries. The fossil mammals suggest either a latest Hemphillian (latest Miocene-Pliocene) or earliest Blancan (earliest Pliocene) age for the assemblage. The peccaries can be assigned to two taxa: *Catagonus brachydontus*, a large species with brachydont, bunodont cheek teeth, found in the latest Miocene of Mexico, Florida, and Oklahoma, which is related to the living Chacoan peccary *C. wagneri*, and *Platygonus pollenae*, a newly described latest Miocene taxon. The latter is the smallest and most primitive species known from the lineage which culminated with the flat-headed peccaries (*Platygonus compressus*) common in the Pleistocene. Both of these species are unknown from the early Blancan, and support (along with the rhinos and other taxa) a latest Hemphillian age for the fauna.

Introduction

The Pipe Creek Sinkhole biota was discovered in an ancient sinkhole deposit eroded into the underlying Silurian limestones near Swayzee, Indiana (Farlow et al., 2000). It yields a rich flora and fauna that has been described by Farlow et al. (2000, 2006). Shunk et al. (2009) analyzed the paleoclimate of the assemblage, and Farlow et al. (2010) described the coprolites. Farlow et al. (2000), Martin et al. (2002), and Dawson et al. (2008) published a faunal list and described some of the mammals. According to these authors, the lagomorphs suggest an earliest Blancan age for the assemblage, and the carnivorans are early Blancan or older. However, the rodents (Martin et al., 2002) and the presence of the rhinoceros *Teleoceras* suggests a latest Hemphillian age (Prothero, 1998), although there are some claims that rhinos survived in North America until the earliest Blancan (Prothero, 2005; Gustafson, pers. commun. to DRP).

Farlow et al. (2000) mentioned the presence of an "unidentified large peccary" in the fauna, but made no further comments on the specimens. In the course of Prothero's ongoing revision of the North American Tayassuidae beginning in 2007 (first installment published in Prothero, 2009), we learned of these specimens. Farlow loaned them to HAS so they could be compared to specimens in the American Museum of Natural History (AMNH) and properly identified. When we first studied them in the AMNH in January 2009, the systematics of North American late Miocene-Pliocene peccaries had not been resolved well enough to make a reliable comparison with valid taxa. Since then, Prothero and co-authors (Prothero and Grenader, 2012; Prothero, in prep.) have updated the systematics of these taxa, and now the Pipe Creek specimens can be compared to valid taxa and properly identified.

Materials and Methods

This study began in 2008 as a graduate student research project by Sheets. It is published separately here, but it is part of a much larger complete monographic revision of the Tayassuidae currently being written (Prothero, in prep.).

All measurements were made with digital calipers, and recorded in Excel spreadsheets. All statistics and plots were done in Excel. Photos were taken with a Nikon 5700 camera, and then edited in Photoshop.

Abbreviations: AMNH, American Museum of Natural History, New York, including the Frick Collection (F:AM); INSM, Indiana State Museum; TMM, Texas Memorial Museum, Austin.

Systematic Paleontology

Class MAMMALIA Linneaus 1858 Order ARTIODACTYLA Owen 1848 Family TAYASSUIDAE Palmer 1897

Α B 5 cm

Figure 1. A, *Catagonus brachydontus*, INSM 71.3.144.2003, M2-3. B, cast of AMNH 101932, a palate of *C. brachydontus* from the Bone Valley Formation, Florida, for camparison. Scale bar equals 5 cm. Photo by Jim Whiteraft, courtesy J. O. Farlow.

Catagonus Ameghino 1904 Desmathyus brachydontus Dalquest and Mooser 1980 Catagonus brachydontus Wríght, 1983 Fígures 1–2, Table 1

Type specimen

TMM 41685-13, a left m3 from the late Hemphillian Rancho el Ocote fauna (Dalquest and Mooser, 1980, Figure 4).

Referred material

INSM 71.3.144.2003, maxillary fragment with right M2-3 (Figure 1).

Description

INSM 71.3.144.2003 consists of two upper molars, M2 and M3, which show a high degree of wear, so that the cusps are deeply worn into lakes or fossettes. M2 is the more worn of the two teeth



Figure 2. Graph of upper teeth dimensions from Pipe Creek Sinkhole compared to known peccary samples. A, plot of M2 dimensions. B, plot of M3 dimensions. Symbols: open square equals *P. pollenae* from Edson Quarry, Kansas; open diamonds equals *C. brachydontus* from the Bone Valley Formation, Florida; solid circle equals holotype of *P. rex*; larger solid diamond equals INSM 71.3.144.2003; smaller solid diamond equals INSM 71.3. 144.2007.

(since it erupts earlier than M3), and nearly all the crown pattern has been worn away. The paracone and protocones have worn down to a large transversely oval-shaped fossette with slight enamel ridges where the anterior cingula have been joined to the cusp fossettes due to wear. There is a distinct lingual cingulum on the tooth that forms a bridge between the anterior and posterior fossettes, but no labial cingulum. The posterior fossette has a more rounded shape than does the anterior fossette, with slight crenulations in the surrounding ridge of enamel where the



Figure 3. INSM 71.3.144.2007. Right upper M2 in occlusal view. Scale bar equals 1 cm. Photo by Jim Whiteraft, courtesy J. O. Farlow.

metacone was separated from the metaconule, and where the posterior cingulum has merged with the worn basin of the metacone-metaconule. The rounded shape of this fossette and the enamel ridges suggest that prior to wear this tooth bore discrete bunodont cusps as in *Catagonus*, not lophodont or zygolophodont cusps as in *Platygonus*.

M3 of INSM 71.3.144.2003 is also highly worn down into fossettes surrounded by ridges, but not as worn as M2. There is a strong anterior cingulum that wraps around the worn bases of the paracone and protocone, each of which is marged by a round or oval enamel ridge within the anterior fossette, the worn base of a rounded or oval bunodont cusp. The oval base of the paracone fossette is much smaller than that of the protocone fossette. There is a strong labial cingulum that wraps into the intervallum between the anterior and posterior fossette. There is a distinct but weak lingual cingulum, which forms a weak and discontinuous ridge in the lingual intervallum between the anterior and posterior fossettes. The posterior fossette on the M3 still bears the remnant of a highly worn metacone, which was clearly conical and bunodont in shape before wear. There was also a discrete conical metaconule connected directly to the lingual side of the metacone, now represented by a loop of enamel within the fossette. There may have been a third cusp anterior to the metacone and metaconule, since the loops of worn enamel suggest such a cusp, and cusp variability is very high in peccaries (Simpson, 1949; Slaughter, 1966; Guilday et al., 1971; Wright, 1991). At the posterior end of the crown is a worn pair of cusps connected to

Table 1. Statistics of tooth dimensions. First three columns are INSM 171.3.144.2003, INSM 171.3.144.3010, and INSM 171.3.144.2007 respectively. N = number of samples; SD = standard deviation.

Dimension	2003	3010	2007	P. polleni			C. brachydontus		
				Ν	Mean	SD	Ν	Mean	SD
P2L		8.1		18	9.92	0.71	6	12.28	0.85
P2W		8.9		18	8.66	0.65	6	11.58	1.52
P3L		11.6		18	11.69	0.75	8	13.62	0.87
P3W		13.2		18	10.54	0.84	8	13.38	0.82
M2L	21		15.5	18	15.97	1.93	8	20.3	0.72
M2W	20		14.9	18	14.87	1.65	8	18.39	1.28
M3L	27.6			16	19.4	1.58	8	24.5	1.62
M3W	22.2			16	15.12	1.33	8	18.78	0.47



Figure 4. INSM 71.3.144.3010. Maxilla with P2 and P3, referred to *P. pollenae*. A, crown, and B, lateral views. Scale bar equal 1 cm. Photo by Jim Whiteraft, courtesy J. O. Farlow.

the posterior cingulum, which are now represented by a pair of enamel loops that once formed their base. Finally, the lingual, posterior, and labial cingulum forms a continuous ridge around the outside of the tooth, but these cingula are not as strong nor discrete as they are on the M2.

Discussion

The sample from Pipe Creek Sinkhole does not appear to come from a single species of peccary, but at least two. Specimen INSM 71.3.144.2003 is clearly a very large species, whereas the remaining tooth specimens seem to pertain to a smaller species.

Comparing INSM 71.3.144.2003 to the available sample at the AMNH, it seems clear that the most likely assignment is with *Catagonus brachydontus* Wright, 1983. Dalquest and Mooser (1980) first described this taxon as "*Desmathyus*" *brachydontus*. It is a mark of how long peccary systematics have been in a state of confusion that their specimens were assigned to the early Miocene (late Arikareean-Hemingfordian) genus *Desmathyus* simply on the basis of its primitive bunodont cusp morphology. This is despite the fact that the Rancho el Ocote material is much larger than any known specimen of *Desmathyus*, and from beds at least 10 million years younger than this early Miocene genus.

Wright (1983) recognized the true affinities of "D." brachydontus, and re-assigned it to Catagonus, which today is represented by the living Chacoan peccary, C. wagneri. First described in 1975 (Wetzel et al., 1975), C. wagneri is a remarkable case of an animal that was first described as a tooth fossil by



Figure 5. Plot of INSM 71.3.144.3010 (solid diamond), compared to known peccary samples. A, P2 dimensions. B, P3 dimensions. Symbols: open square equals *P. pollenae* from Edson Quarry, Kansas; open diamonds equals *C. brachydontus* from the Bone Valley Formation, Florida.

Florentino Ameghino in 1904, then discovered to be alive almost 70 years later. Wright (1983) described a large number of specimens from the late Hemphillian of Florida (Bone Valley Formation), Oklahoma (Buis Ranch local fauna), and Mexico (Rancho el Ocote local fauna), which clearly showed that "*D*." brachydontus was referable to *Catagonus*, and not to a much older and smaller early Miocene taxon. These include specimens with complete undistorted skull and jaws, and abundant jaws and teeth, as well.

Comparison of INSM 71.3.144.2003 with samples of other peccaries (Figures 1B, 2) shows that its M2 is within the size distribution of *C. brachydontus* from the Bone Valley Formation, Florida. The M3 of INSM 71.3.144.2003, however, appears to be larger than the Bone Valley material (Figures 1B, 2B), but it still falls within the size range of the sample from the topotypic locality, Rancho el Ocote (Dalquest and Mooser, 1980, Table 3).

The only other possible match for such a large peccary is *Platygonus rex* Marsh 1894 whose type specimen (YPM 11870) probably came from the Hemphillian Rattlesnake Formation of Oregon. However, *P. rex* is slightly smaller (Figure 2) and has a



Figure 6. INSM 71.3.144.3004. Left ramal fragment with isolated deciduous premolar in, A, crown and B, lateral view. Scale bar equals 2 cm. Photo by Jim Whitcraft, courtesy J.O. Farlow.

much more zygolophodont dentition than INSM 71.3.144.2003. The *Platygonus* species known from the Pliocene (*P. bicalcaratus, P. texanus, P. pearcei*) are within the size range of INSM 71.3.144.2003, but they all have much more lophodont or zygolophodont teeth than INSM 71.3.144.2003F.

Thus, in its relatively brachydont cusp morphology but large size, INSM 71.3.144.2003 is assigned to *C. brachydontus*, a taxon known only from the late Hemphillian.

Platygonus Le Conte, 1848 Platygonus pollenae Prothero and Grenader, 2012 Figures 3-6, Table 1

Type specimen

AMNH 17582, fragmentary skull and palate; from the latest Hemphillian ZX Bar local fauna, Johnson Member of the Snake Creek Formation, Sioux County, Nebraska (Skinner et al., 1977).

Referred material

INSM 71.3.144.2007, INSM 71.3.144.3010, and possibly other small tooth fragments from Pipe Creek Sinkhole (Figures 3, 4).

Description

INSM 71.3.144.2007 (Figure 3) is a highly worn isolated upper right M2 with roots exposed. Both the paracone-protocone and metacone-metaconule cusps are so worn that they form elongate oval-shaped fossettes. The paracone-protocone fossette bears slight enamel ridges where the anterior cingulum has merged with the cusps due to wear. No other traces of the original cusps remain. However, the shape of the base of those cusps, and the parallel flat sides in the transverse axis (rather than convexly curved sides) of the fossette suggest that the tooth was zygolophodont or lophodont, as confirmed by the well-developed intervallum between them. The metacone-metaconule fossette is also parallel-sided in the transverse axis, but bears convexly rounded bulges of the surrounding enamel ridge where the hypocone would have been, and another protruding into the intervallum between the ridges. The enamel outlines suggests that this part of the tooth was not as lophodont or zygolophodont as the other, but still much more so than the condition seen in the M2 of 1NSM 71.3.144.2003. When plotted with M2s from other Hemphillian peccaries (Figure 2), it falls completely within the *P. pollenae* size cluster.

INSM 71.3.144.3010 is a portion of an upper left maxilla with P2 and P3 preserved (Figures 4, 5). Both are relatively unworn with well-developed cusps, in contrast to INSM 71.3.144.3007 and INSM 71.3.144.2003. P2 has a small conical metacone, an anteriolingually displaced paracone, and a large protocone, forming a triangle with the apex oriented anteriorly. There is a discrete posterior cingulum with an intervallum separating it from the main cusps, and in lateral view (Figure 4B) one can see the weak lingual and posterior cingula that wrap around the crown of the tooth. P3 is considerably larger than P2, but has a similar arrangement of cusps: a small labial metacone, a larger anteromedially shifted paracone, and a large protocone, with posterior and lingual cingula wrapping around. These tecth have the typical simple crown patterns seen in most peccary teeth, and since peccary premolars are known to have high intrapopulational variability (Simpson, 1949; Slaughter, 1966; Guilday et al., 1971; Wright, 1991), they are not very diagnostic taxonomically.

The remaining tooth material is less diagnostic. INSM 71.3.144.3004 is a right ramal fragment with portions of deciduous premolars preserved (Figure 6). Deciduous premolars are very rarely preserved in most peccary specimens, and where they are known they are highly variable and non-diagnostic (Simpson, 1949; Slaughter, 1966; Guilday et al., 1971; Wright, 1991). INSM 71.3.144.3005 is an upper right maxillary fragment, again with a portion of a deciduous premolar that is not very useful taxonomically. INSM 71.3.144.3007 is a fragment of a premolar crown that cannot be identified beyond the fact that it came from a peccary. INSM 71.3.144.3008, INSM 71.3.144.3009, and INSM 71.3.144.3006 are fragments of the crown of a tooth showing a single cusp, again non-diagnostic beyond "Tayassuidae". Based on overall size, all these fragments could belong to the smaller taxon at Pipe Creek Sinkhole, although they are too poorly preserved to be certain of this.

Discussion

As described above, the smaller material from Pipe Creek Sinkhole consists of a single right M2 (INSM 71.3.144.2007) and a maxillary fragment with P2 and P3 (INSM 71.3.144.3010), as well as other tooth fragments. INSM 71.3.144.2007 is very highly worn, but clearly shows some sort of bilophodonty or zygolophodonty, which makes it referable to *Platygonus*. Although they are not highly diagnostic, the premolar morphology of INSM 71.3.144.3010 seems to be a good match for the premolars of Platygouus as well. Prothero and Grenader (2012) described a new, very primitive species of *Platygonus*, *P. pollenae*, currently known only from the latest Hemphillian of Nebraska (ZX Bar local fauna, Snake Creek Formation), Kansas (Edson local fauna), Colorado (Wray local fauna), and Texas (Coffee Ranch local fauna). In size and morphology, INSM 71.3.144.2007 and INSM 71.3.144.3010 are good matches for the known sample of *P. polleuae* (Figures 3–5, Table 1). They are clearly too small to pertain to the larger species of *Platygonus*, such as *P. rex* and

the Blancan species mentioned above, so *P. pollenae* is the only reasonable referral. In its size and morphology, *P. pollenae* is a very distinctive peccary not easily mistaken for any other species in the Hemphillian and Blancan. It is known only from the late Hemphillian.

Conclusions

Two taxa of peccary are represented at Pipe Creek Sinkhole: the large bunodont species *Catagonus brachyodontus*, and the small zygolophodont species *Platygonus pollenae*. Both are currently known only from the late Hemphillian and have no record in the Blancan. Thus, they support the idea that at least part of the Pipe Creek Sinkhole fauna is latest Miocene, not Pliocene.

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